have small pearls of this texture adhering to the centre of each valve.

As a guide to the form of this species, I may mention that the figure of *Yoldia Woodwardi* in the 'Thesaurus Conchyliorum,' vol. iii. pl. 226. f. 22, gives a very fair idea of it, except that the umbo is situated too near the acuminate end.

XV.—*On the Embryogeny of* Lamellaria perspicua. By M. A. Giard*.

The recent researches on the embryogeny of the Pectinibranchiate Gasteropods relate to a very small number of types—*Paludina vivipara* (Leydig), *Calyptræa sinensis* (Stefanoff and Salensky), and *Purpura lapillus* (Selenka). It was not, therefore, useless to undertake the study of the development of a sufficiently abnormal group, that of the Sigaretidæ.

Lamellaria perspicua lays its eggs at Wimereux during the months of February and March. This mollusk hollows out its nest in the colonies of the compound Ascidia, from which it derives its nourishment (*Leptoclinum maculosum* and *Polyclinum succineum*). The nest has been seen and described by Hennedy and Peach. I will only add that the transparent operculum, which closes it, presents circular and concentric striæ, indicating that the female turns on herself during oviposition, as also do a large number of nudibranchiate mollusks. Each capsule contains, besides the normal eggs, a certain number of rudimentary eggs, which serve at a later period for the nourishment of the embryo. The ovarian egg presents a vitelline membrane; the deposited egg is quite destitute of it. Its contents are formed chiefly of fatty globules, which do not allow one to see the germinal vesicle. Just as segmentation is about to commence, a spot of a dull white colour appears at the surface of the egg, to disappear soon after. The egress of the polar corpuscles could not be observed.

The egg separates into two parts, of which the largest divides in its turn into two and then into three. We have thus four spheres—namely, a large one (the still undivided primitive sphere) and three small ones. These four spheres are not arranged in a cross, but in a tetrahedron, like four cannon-balls forming a pile. In the portion situated between the points of contact of the four spheres, each of them gives birth

* Translated by W. S. Dallas, F.L.S., from the 'Comptes Rendus,' 22nd March, 1875, p. 736.

to a much smaller cell, with finely granular protoplasm. Thus is effected the separation of the plastic vitellus from the nutritive vitellus. The plastic spherules have a nucleus and a nucleolus, and they soon multiply rapidly; while the number of large nutritive spheres augments, on the contrary, with extreme slowness. The plastic spherules not only form a mass at one point of the egg, as has been already described and figured in *Vermetus*, but they invade and cover up all the nutritive vitellus, forming the ectoderm. The nutritive spheres, the division of which takes place less rapidly, give origin to the endoderm. All this process resembles very closely that which has been observed in certain worms (for example in *Euaxes*) by Kowalevsky.

After segmentation the first modification that takes place is a thickening of the ectoderm, at a point near that where this lamella finally closes (*prostoma*). This thickening becomes covered with vibratile cilia and hollowed by a cavity (cephalic vesicle). At the same time the definitive mouth is formed by an invagination of the ectoderm situated on the anterior third of the embryo, below the cephalic vesicle. The cephalic expansion soon divides into three lobes, a median and two lateral lobes, forming a sort of trefoil open below where the buccal opening is situated. The median lobe is covered with very fine vibratile cilia; the lateral lobes are bordered by a row of large cylindrical cells provided with much longer cilia. The embryo turns rapidly on itself in the mucus which fills the nest. It absorbs the rudimentary eggs, and, even under the microscope, the matters proceeding from the diffluence of the neighbouring embryos. Some cells detach themselves from the ectodermic lamella in the median lobe, and emit processes which unite them on the one hand to this lamella and on the other to the œsophageal invagination. This is the first rudiment of the middle lamella that will produce the vascular system.

The lateral lobes soon become considerably developed, and unite to form an irregularly quadrangular ciliated collar, of which the lateral parts become forked and are formed at a later period into elegantly pigmented vela. No traces of tentacles are to be seen.

The foot is derived from a thickening of the ectoderm situated under the mouth; this thickening is ciliated at its free extremity. The nervous system appears under the form of an inflation of the ectoderm situated on each side at the point of junction of the lateral lobes with the cephalic vesicle; the two inflations afterwards approach the median line and are

united by a commissure which becomes shorter and shorter. The eyes are formed at the inferior angle of these inflations, at the expense of the ectoderm; their development progresses *pari passu* with that of the subœsophageal nervous centres; at the time of hatching they enclose two refractive vesicles. The otocysts appear at the base of the foot at the time of the formation of the latter, and before the existence of any nervous organ; their wall is composed of very small cells belonging to the ectoderm.

As soon as the stomach is differentiated at the expense of the endoderm, its cavity and the lumen of the œsophagus are lined with very delicate vibratile cilia. At the same stage we see, on the right side of the embryo, a rounded mass of large cells, which will form the kidney. The residue of the endodermic spheres not differentiated is pressed back to the lower extremity of the embryo, and gives origin, not to the liver, which originates from the stomach, but probably to the genital organs. I have not been able to follow the formation of these last organs or of the anal gland, which is much developed in the adult *Lamellaria*.

The cavity of the mantle is formed by a very rapid development of the secretory pad of the shell. The pallial contour is pigmented with brown and yellow. The dorsal part of the mantle is finely ciliated. Above the digestive tube and along the lower part of the foot we find some contractile sinuses, the first indications of a circulatory system.

The preconchylian invagination, the general importance of which in the Mollusca was first pointed out by Ray Lankester, is not so strongly marked in *Lamellaria* as in certain nudibranchs (*Dendronotus arborescens*, *Goniodoris nodosa*) in which I have had the opportunity of observing it. We see in the lower part of the embryo, at that stage when the cephalic vesicle begins to be differentiated, the ectoderm become hollow very slowly and leave a thin cuticle free, which is the rudiment of the first shell. The cushion which borders this invagination ascends by degrees along the embryo, in the same way as a wave of liquid propagates itself, at the same time that the bottom of the invagination resumes its original form and position. The thickness of the cushion keeps the embryo away from the shell; and the ectodermic cells continuing their secretion, a second shell is formed inside the first, but closely applied to the body of the embryo. The first shell is of a nautiloid form, and presents two dorsal and two lateral keels; it resembles the shell of *Atlanta*. The second shell is more simple, and resembles in its appearance that of *Carinaria*,

or of the embryos of the Nudibranchs. These two shells are united at their apertures by means of a very thin membrane. They have the same relations to each other and the same relative signification as the nauplian cuticle of the embryos of the Cirripedes and the carapace of the *Archizoëa* enclosed under that cuticle. I do not think that the second shell is the origin of the calcareous shell of the adult *Lamellaria*. I have been unable to ascertain this fact by direct observation; for the nautiloid embryos, after having swum some days in the aquariums, die without undergoing any other transformation.

The embryogeny of *Lamellaria* takes considerable time for its accomplishment (two or three weeks). The larvæ break down with great rapidity when they are removed from the mucus which bathes them. Nitric acid has been of great service to me in these delicate researches.

XVI.—*Description of a very large Species of* Scotophilus *from Western Africa.* By G. E. Dobson, M.A., M.B.

Scotophilus gigas, n. sp.

Ear-conch and tragus like those of *S. borbonicus*, Geoffr.; but the internal basal lobe of the ear is more rounded and its inferior horizontal margin is straight, not in the least degree concave; the upper third of the outer margin of the conch is slightly but distinctly concave; and the tragus has the narrow ridge, proceeding from the base of its inner margin across its front margin, as well developed as in *S. Temminckii*.

Wings to the metatarsus near the base of the toes; last two caudal vertebræ and half the third last vertebra free.

Fur above deep chestnut, beneath yellowish white. The fur on the upper surface is short and does not extend anywhere upon the membranes, terminating by a well-defined line, and not extending posteriorly as far as the root of the tail; beneath, the wing-membrane is thinly covered as far as a line drawn from the elbow to the knee-joint, and a band of fur passes outwards, posterior to the forearm, to the carpus, as in *Vesperugo noctula*. The face in front of the eyes is nearly naked.

Upper incisors with a posterior horizontal expansion of the cingulum, as in *S. borbonicus*; lower incisors crowded. The other teeth as in *S. Temminckii*.

Length (of an adult female preserved in alcohol), head and body 4·6 inches, tail 3·6, tail free from membrane 0·35,